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BOTANY SECTION

THE BARBERRY BUSH AND BLACK STEM RUST OF SMALL GRAINS

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During the season of 1916 the cereal crop of the middle west suffered another severe epidemic of black stem rust (*Puccinia graminis*). It is estimated that this disease caused a loss of $110,000,000 in the wheat growing districts of Minnesota, North and South Dakota, and Nebraska. In the four principal spring wheat growing provinces of Canada the damage was placed at $100,000,000. Altho Iowa did not suffer as severely as adjoining states on the north, yet the damage was probably not less than $5,000,000. Unquestionably, these severe losses are in a large measure responsible for the present high cost of food stuffs. The protection of the cereal crops from this rust is of importance, not only to the farmer who grows the grain, but also to every bread consumer.

This black stem rust is spread by the European barberry bush, a common ornamental shrub. This has been known for more than 50 years, but it is only within the past decade that we have come to appreciate fully the important role this shrub plays in spreading this disease. The European barberry bush (shown in fig. 1) is used very commonly on lawns, parks, drives, graveyards, etc. It has no other

Fig. 1—European or Common Barberry (*Berberis vulgaris*) bush in winter condition. A large coarse bush, 6 feet high, with three-pointed thorns.

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Fig. 2—Japanese Barberry (*Berberis Thunbergii*), a small bush two feet high with single-pointed spines.

commercial value and there are numerous other shrubs that are fully as desirable for ornamental purposes. This is especially true of a closely related species, the Japanese barberry, which is immune and does not harbor the grain rust. (See fig. 2.)

LIFE HISTORY OF RUST

The role that the European barberry bush plays in propagating and spreading black stem rust is as follows:

The black stem rust disease is caused by a microscopic plant closely akin to such plants as bread mold and green mold occurring on over-ripe fruit and old bread. Such plants are known as fungi and always derive their nourishment either from living or dead plant tissues. The rust fungus can grow only on living plants and therefore it is said to be a parasitic fungus, of which there are a large number attacking many useful plants.

There are several rust fungi on cereals, the most destructive of which is the one causing black stem rust. It appears in the spring on stubble and straw as long black pustules (fig. 4), filled

Fig. 3—Two twigs of Barberry. A—Japanese barberry (*Berberis Thunbergii*) has single-pointed spines. It is safe to plant. B—European or Common Barberry (*Berberis vulgaris*) has three-anese Barberry (*Berberis Thunbergii*) thorns. It harbors black rust and should not be planted.

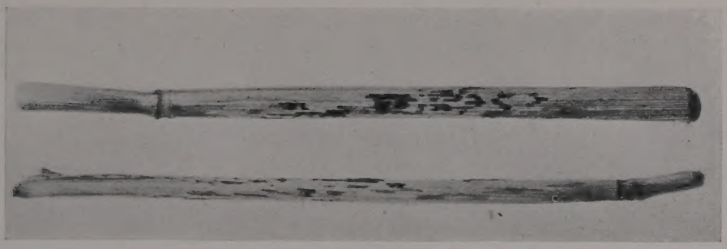

Fig. 4—Pustules of black winter spores on stem of oats which have laid out over winter.

Fig. 5—Pustules of red summer spores on a leaf of oats.

with "seeds" or winter spores of the parasite (fig. 6C). These start to grow, or germinate, in the spring and produce another crop of spores that are blown by the wind to the leaves of barberry bushes. Under favorable conditions the spores penetrate the leaf tissue and in 6 to 10 days a yellow, cup-like pustule developes on the lower side of the barberry leaf. These yellow cups are filled with another crop of spores (fig. 6A) which are very light and naturally some find their way to the grain fields.

Once on the leaves and stems of the grain crop these spores send their threads into the tissues and in about a week a brick red pustule appears (fig. 5). In each of these pustules there are thousands of summer spores (fig. 6B), each one of which may cause an infection on neighboring wheat plants.

It is the rust colored summer spores that fly so profusely when oats are being cut during severe outbreaks of this disease. It is plain to be seen that when this parasite has once gotten into a field it may spread rapidly. The rust has usually obtained a good foothold in the fields by the time the grain comes into blossom. At this time the foliage is dense and dew and rain evaporate slowly, leaving very desirable conditions for germination and infection. It is usually between the time that the grain heads and that it ripens that the rust becomes abundant and does serious damage.

OTHER POSSIBLE WAYS THAT THE RUST IS SPREAD

It should be pointed out that there is some evidence that the summer spores may live over from one year to another when covered with snow or in some protected place. Again, some rust experts claim that rust spores may be blown from the south in the spring when the grain crops are growing. Others believe that the threads of the fungus live over in the cereal crops that survive the winter. Under these conditions the barberry bush plays no part. Be this as it may, the evidence is conclusive that the European barberry harbors one stage of this disease and helps to spread it.

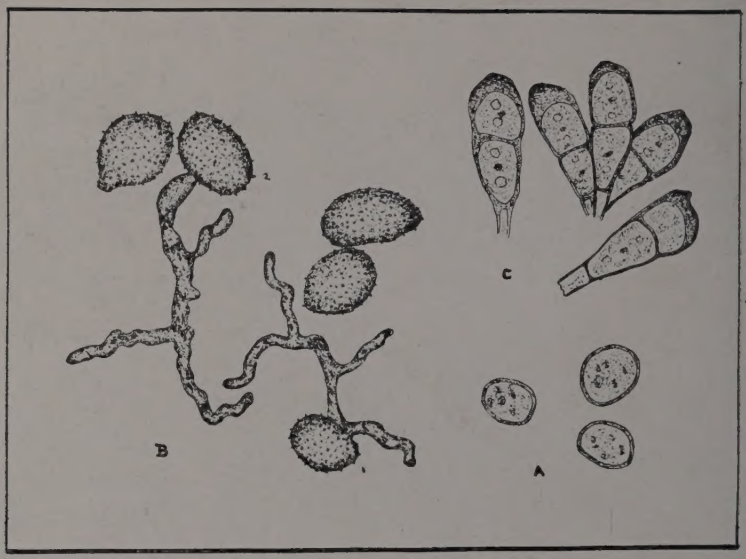

Fig. 6—Spores of Black Stem Rust. A—Aecidiospores from Barberry leaf. B—Uredospores, summer spores from leaf of small grain. 1 and 2, summer spores germinating. C—Teleutospores, winter spores from wheat straw.

GET RID OF THE BARBERRY BUSH

The most practical way so far suggested for reducing the ravages of this disease is by getting rid of the European barberry bush. Denmark has accomplished remarkable results by exterminating this shrub. North Dakota has recently passed a law for the eradication of the European barberry from the state before July 1, 1917. Similar laws are being agitated in Minnesota and in Canada.

In Iowa chiefly two different kinds of barberry bushes are found, the European or common barberry (*Berberis vulgaris*), and the Japanese barberry (*Berberis Thunbergii*). The *Berberis Thunbergii* is a low bush from one to four feet high bearing small smooth edged leaves and single-pointed spines on the stems. *Berberis vulgaris*, on the other hand, is a larger shrub, from four to eight feet high, bearing larger leaves with spiny margins and three-pointed thorns on the stems. These two shrubs are shown in their winter condition in figs. 1 and 2. The difference in the spines is best shown in fig. 3.

The Japanese barberry is immune or does not spread the black stem rust and happens also to be the more highly prized for ornamental purposes. There are a considerable number of varieties of the two species offered for sale by some nursery men.

STOP PLANTING EUROPEAN BARBERRY

It is strongly urged that no further plantings of European barberry bushes be made. The immune Japanese barberry or some other shrubs should be substituted, particularly where barberries are growing in close proximity to grain fields. This shrub that harbors black stem rust should be dug up and destroyed at once.